3 SURF - Sanford Underground Research Facility

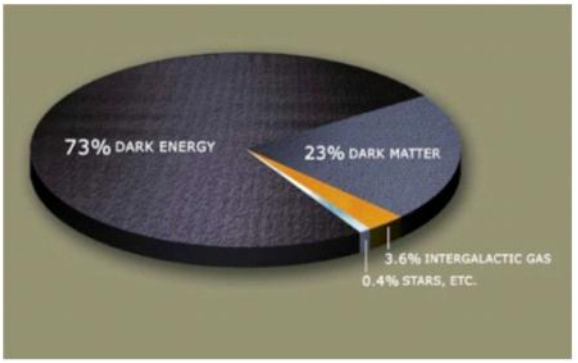
Wednesday, February 05, 2014
7:14 AM

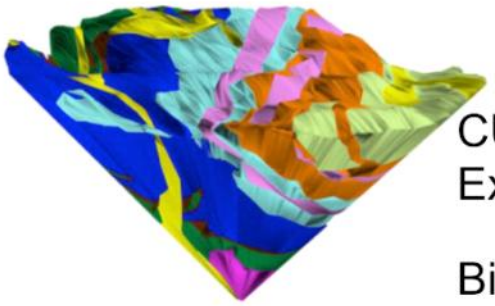
Current Underground Science Program

Majorana Demonstrator:
neutrinoless double-beta decay

$0\nu\beta\beta$

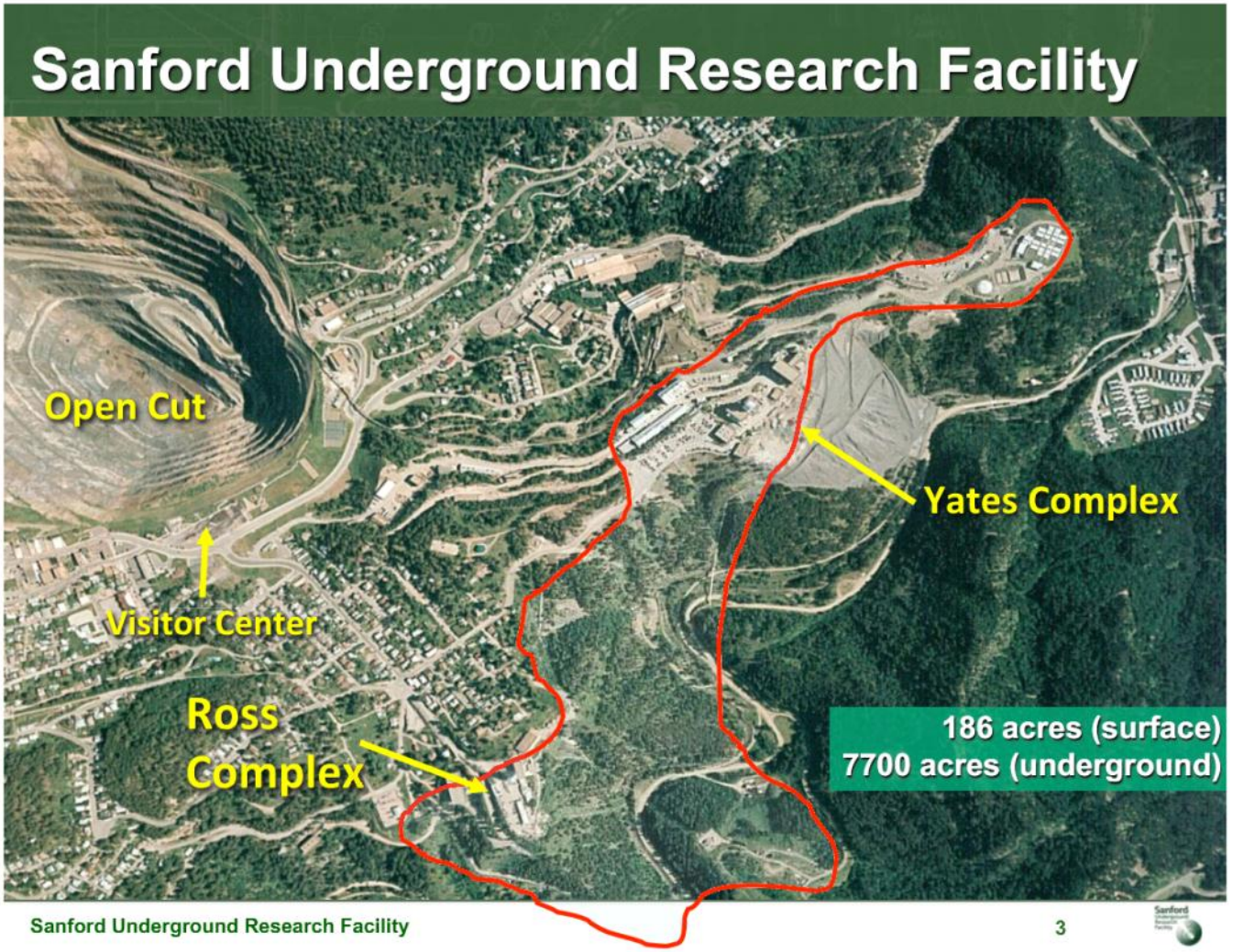
Large Underground Xenon (LUX):
detection of dark matter



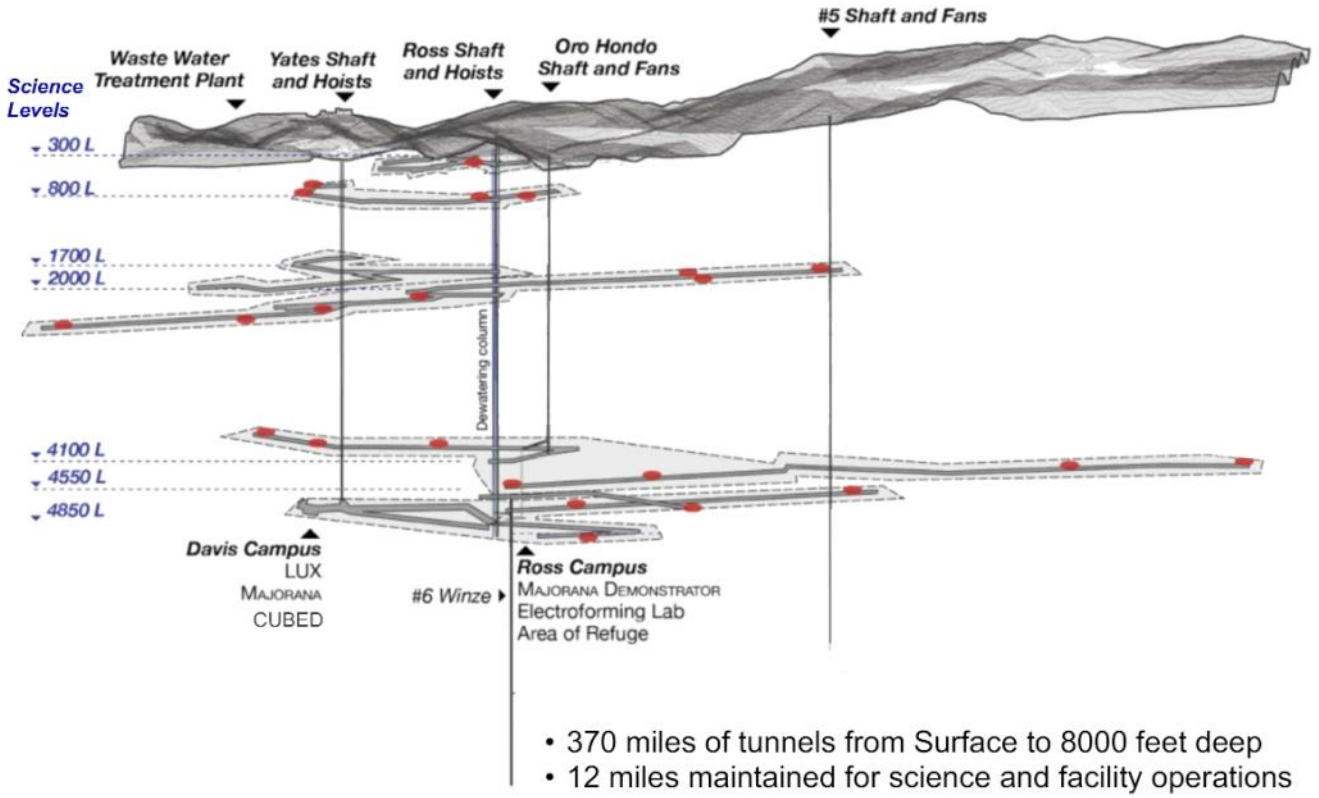


CUBED: Center for Ultra-Low Background Experiments in the Dakotas

Biology, geology, engineering: the BGEs

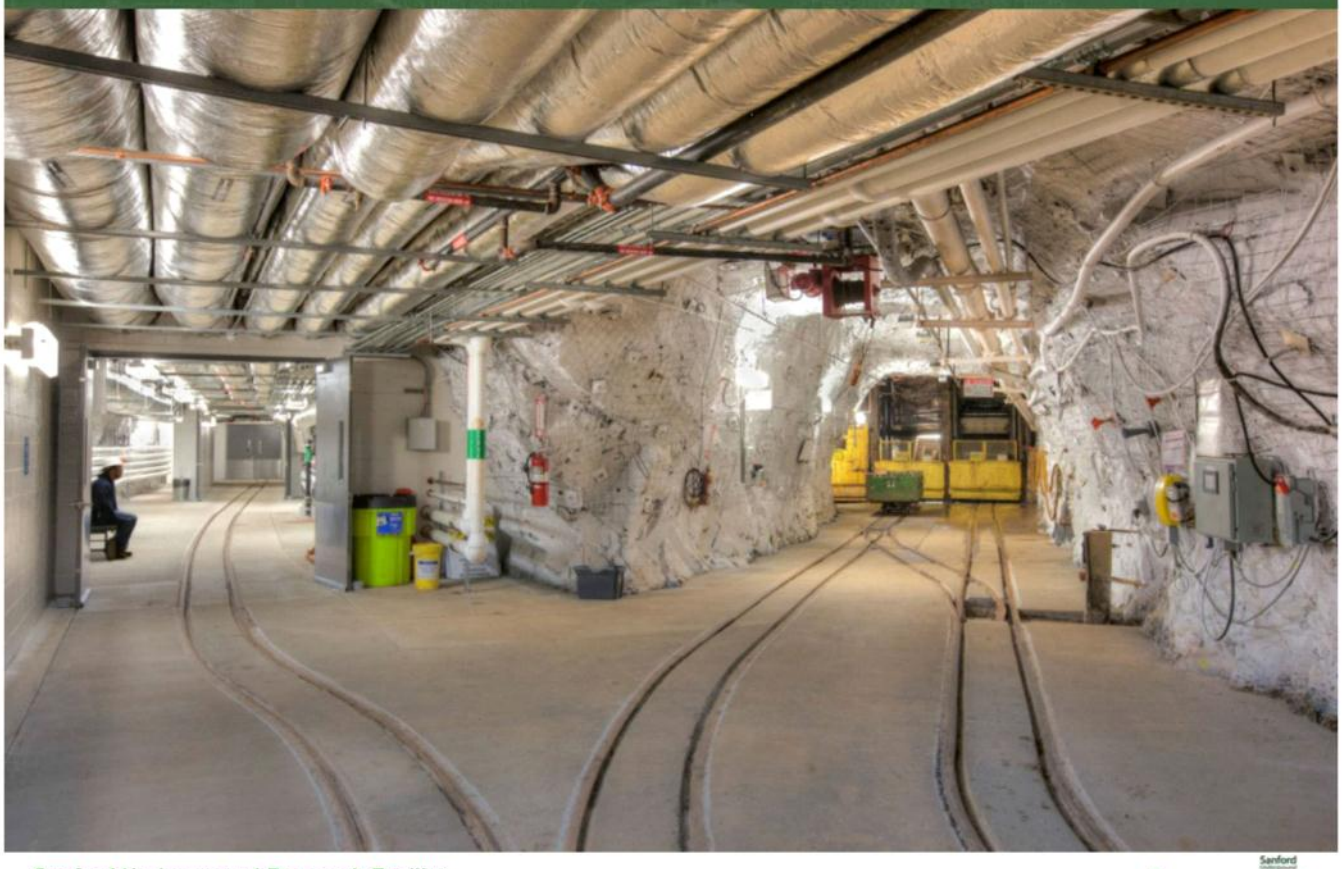

Sanford Underground Research Facility
Open Cut
Yates Complex
Visitor Center
Ross Complex
186 acres (surface)
7700 acres (underground)
Sanford Underground Research Facility
3

Underground Lab Geography



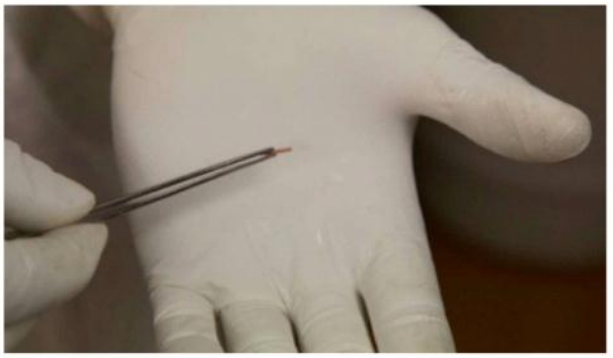
- 370 miles of tunnels from Surface to 8000 feet deep
- 12 miles maintained for science and facility operations

Davis Campus Entrance on 4850L



World's Deepest Clean-Room Machine Shop

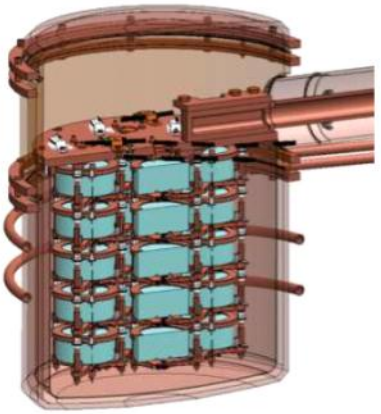
Producing ultra-pure copper parts and shielding for MAJORANA



MAJORANA Detector Assembly

MAJORANA Detector Shield Under Construction

Detector operations (i.e. data collection) to start in late 2014.



LUX Installed in the Davis Cavern

LUX Detector Deployed in Water Shield Tank

World's Most Sensitive Dark Matter Experiment

LUX First Results Announced on October 30th at Sanford Lab

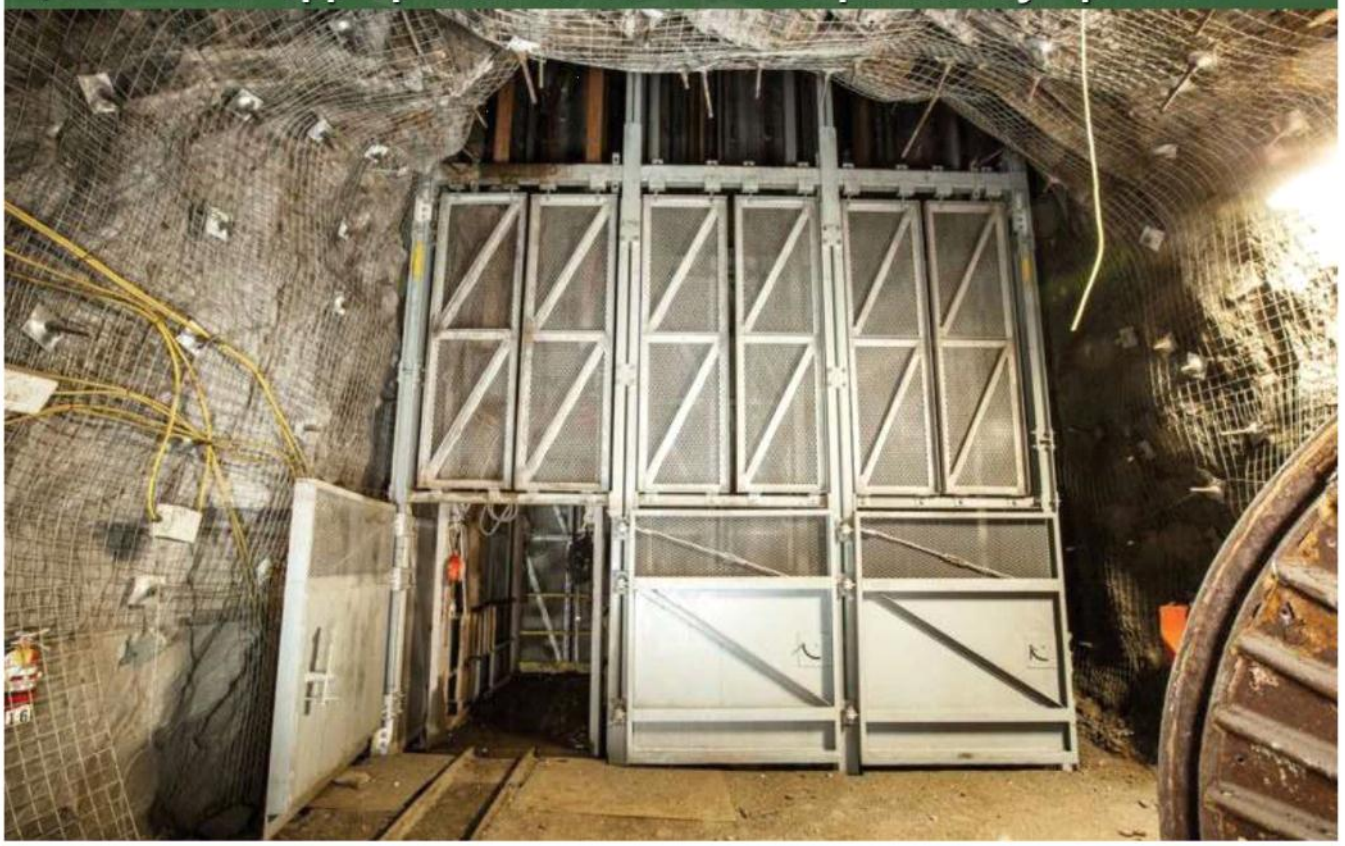
- LUX's initial 85-day run produced the first physics results for Sanford Lab!
- Event included Gov. Daugaard, DOE, NSF, SD congressional delegation reps, state legislators
- SDPB broadcasted event worldwide via the web
- LUX 300-day run planned to start mid-2014
- Next generation experiment called LUX-Zeplin (LZ) is competing for NSF and DOE funding. Announcement expected in spring 2014.

Ross Shaft Refurbishment On Track

Completed from Surface to the 1,378' mark. Planning June 2017 finish.

Ross Shaft – 800 Level Station

$2M in FY14 appropriated funds will be expended by April 2014



Sanford Underground Research Facility

Economic Impacts in South Dakota

Spending in South Dakota to date	**$120M+**
Annual total budget (all sources & activities)	$27.1M
Annual operations budget (DOE sponsored)	$12.5M
Annual payroll in SD	$12.1M
Annual non-payroll expenses in SD	$10.5M
Jobs in South Dakota	159
Active research groups	15
Research groups with SD members	14

Sanford Underground Research Facility 14

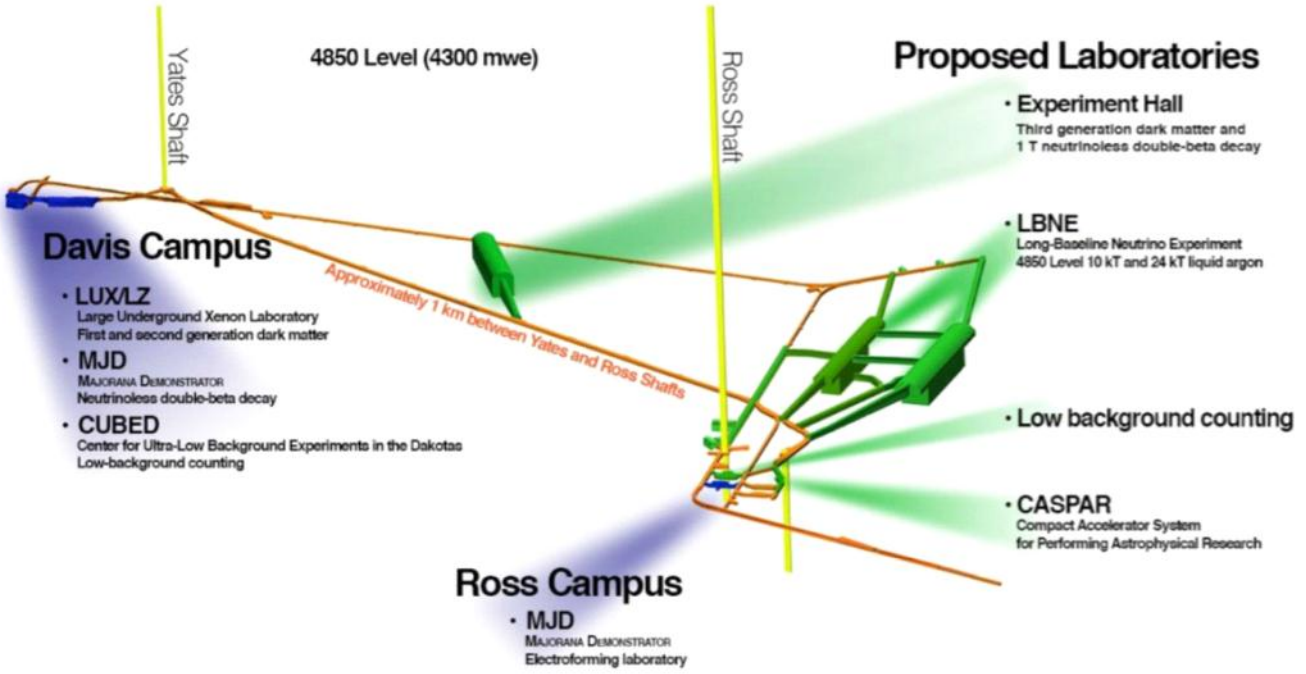
Education and Outreach Impacts

2008 through 2013

Students participating in programs	7,278
Teachers participating in programs	1,523
General public attending programs	13,000+

Projected 4850L Science Laboratories

Protecting the investment in the facility. Extending its longevity.

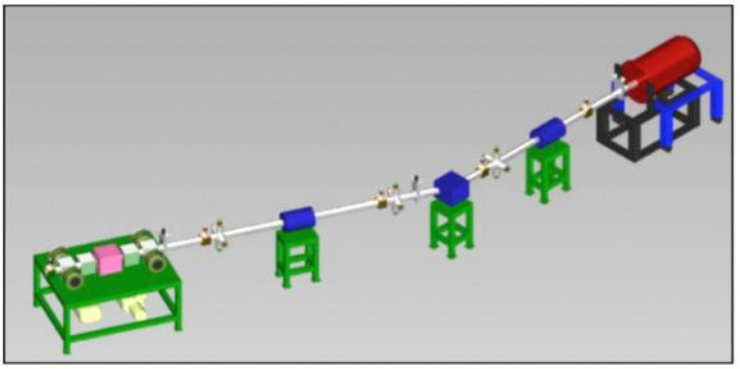


Education & Outreach – New Visitor Center

Sanford gift also enabling facility projects at BHSU and the Lab

Future Experiments: CASPAR

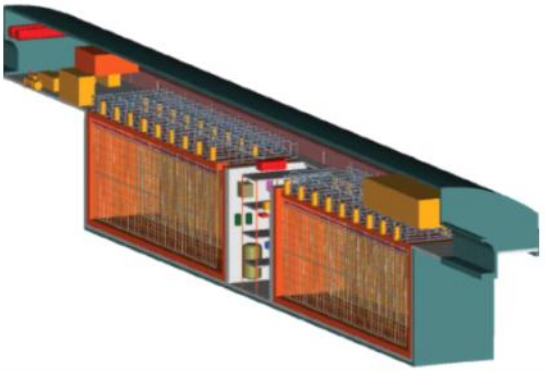
Compact Accelerator System for Performing Astrophysical Research



- CASPAR is a new type of physics experiment planned for installation on 4850L at Sanford Lab
- Expands the lab's science program and facility infrastructure
- CASPAR Collaboration includes University of Notre Dame, SDSM&T, and Colorado School of Mines
- SDSM&T will operate CASPAR
- CASPAR will operate 10+ years—helping extend the lab's longevity
- SDSTA to rehabilitate underground space, and a construction contractor will outfit experiment facility in 2014
- Experiment installation and commissioning planned for 2015

Future Experiments: LBNE

Long-Baseline Neutrino Experiment



- LBNE is a DOE project led by Fermilab
- LBNE Collaboration includes 80+ institutions and 450+ collaborators from around the world
- LBNE plans to construct a large liquid argon neutrino detector on 4850L at Sanford Lab
- SDSTA leading the design and construction efforts for LBNE facilities in SD.
- Construction cost estimated at ~$275M including the experiment equipment.
- LBNE received $26M in FY2014 DOE funds.
- Schedule
  - Geotechnical studies start - March 2014
  - Preliminary design start - September 2014
  - Facility construction start - late 2017

Partnerships growing with SD Universities

Leveraging Lab investments to benefit SD research and education

	BHSU	• Joint Sanford Science Education Center including facility development. • BHSU leads Sanford Lab education and outreach activities.
	DSU	• DSU supports Sanford Lab information technology security program. • DSU leads theoretical physics conference (CETUP) in Black Hills.
	SDSM&T	• SDSM&T and USD are lead SD institutions for physics PhD program. • Sanford Lab scientist enrolled in PhD program at SDSM&T. • SDSM&T faculty member leads on-site activities for Majorana.
	SDSU	• Site visit planned for spring 2014 to discuss collaborative activities.
	USD	• USD and SDSM&T are lead SD institutions for physics PhD program. • Sanford Lab scientist enrolled in PhD program at USD. • USD leads CUBED collaboration with scientists on site at Sanford Lab.

Looking to the Future